

IPCC Assessment and LRTAP Research Agenda

IPCC AR4 chapter 7:
couplings between changes in the climate system and biogeochemistry

TROPOSPHERIC OZONE BUDGETS IN GLOBAL MODELS

	STE Tg yr ⁻¹	P Tg yr ⁻¹	L Tg yr ⁻¹	Dep Tg yr ⁻¹	Burden Tg	Lifetime days
Literature reviewed in TAR (n=11)	770 ± 400	3420 ± 770	3470 ± 520	770 ± 180	300 ± 30	24 ± 2
2000-2004 literature (n=10)	520 ± 100	4570 ± 680	4150 ± 550	1020 ± 220	330 ± 30	25 ± 4
ACCENT (n=25)	520 ± 200	5060 ± 570	4560 ± 720	1010 ± 220	340 ± 40	22 ± 2

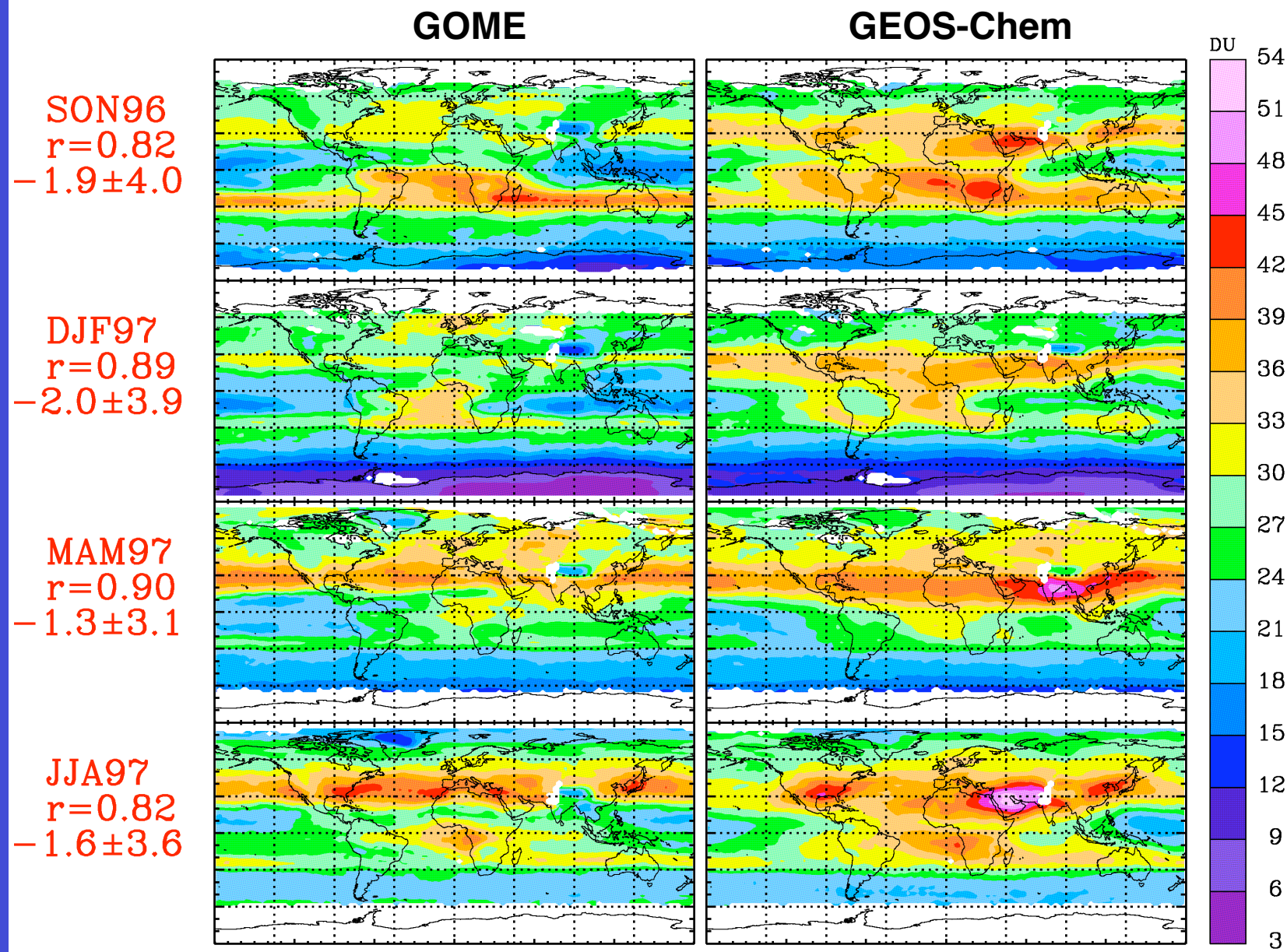
WHY HAS P(O_x) INCREASED BETWEEN TAR AND AR4?

Sensitivity calculations by O. Wild with FRSGC/UCI CTM

	E(NO _x)	E(Isop)	E(CO)	P	L	STE	Dep	Burd	O3life	CH4life
Pre-TAR	42	220	1248	4091	3853	519	757	281	22.3	9.1
Base+I:	42	500	1248	4529	4224	516	817	295	21.4	9.6
Base+N:	51	220	1248	4512	4227	517	803	298	21.6	8.2
OxComp:	50	220	1550	4454	4166	517	802	296	21.8	8.9
ACCENT:51	51	500	1078	4926	4578	514	857	311	20.9	8.4

**Increases in isoprene and NO_x emissions are important drivers;
also possibly radiation, convection, STE**

RETRIEVAL OF TROPOSPHERIC OZONE FROM GOME



X. Liu et al. [2005]

New LRTAP/EMEP Task Force on Hemispheric Transport of Air Pollutants

Chairs: Terry Keating (EPA) and Andre Zuber (Eur. Commission)

CHARGE:

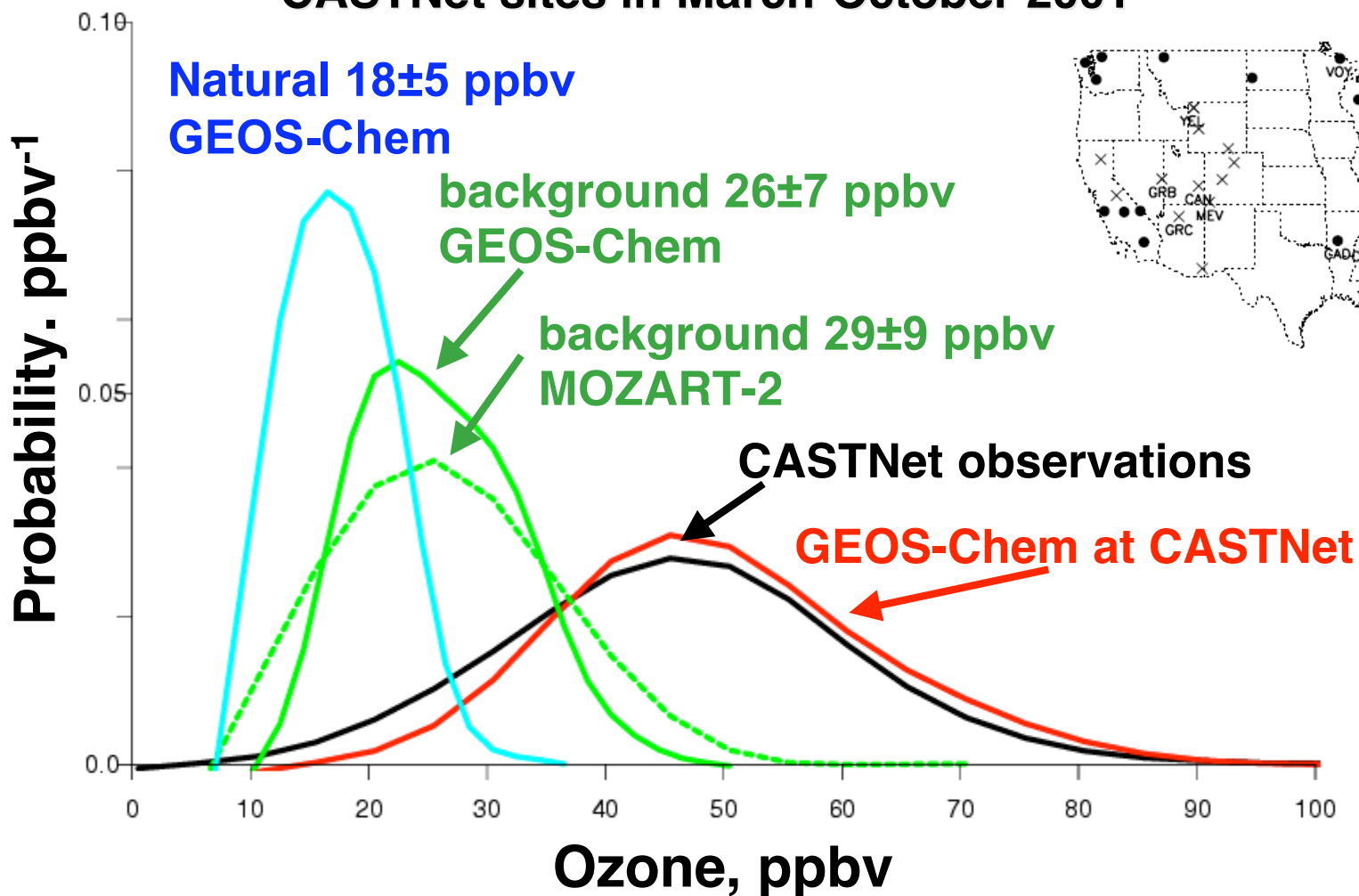
- develop a fuller understanding of the hemispheric transport of air pollution;
- estimate the hemispheric transport of specific air pollutants for the use in reviews of protocols to the LRTAP Convention;
- prepare technical reviews thereon for submission to the Steering Body of EMEP

First meeting: Brussels, June 1-3 2005

PRIORITIES OF TASK FORCE:

- Define quantitative criteria for intercontinental transport of pollution;
- Coordinate modeling efforts, data bases;
- Produce assessments from ensemble of models

Probability distribution of afternoon (1-5 p.m. mean) surface ozone at U.S. CASTNet sites in March-October 2001



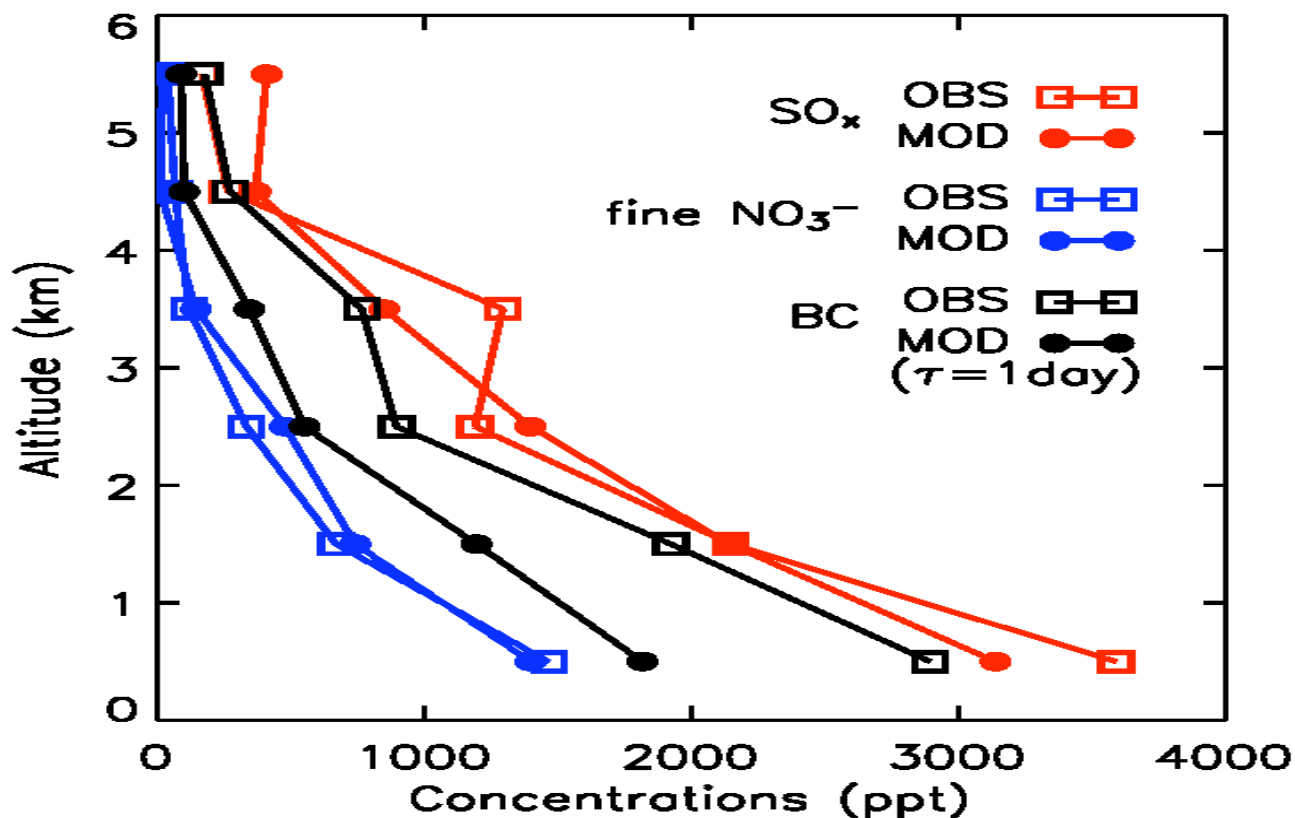
Intercontinental pollution enhances background by 8 ± 4 ppbv relative to natural

A.M. Fiore, GFDL

WET SCAVENGING OF ASIAN AEROSOLS DURING LIFTING TO THE FREE TROPOSPHERE

TRACE-P observations over NW Pacific (Feb-Mar 2001)
and GEOS-Chem simulations

P3B DATA over NW Pacific (30 – 45°N, 120 – 140°E)

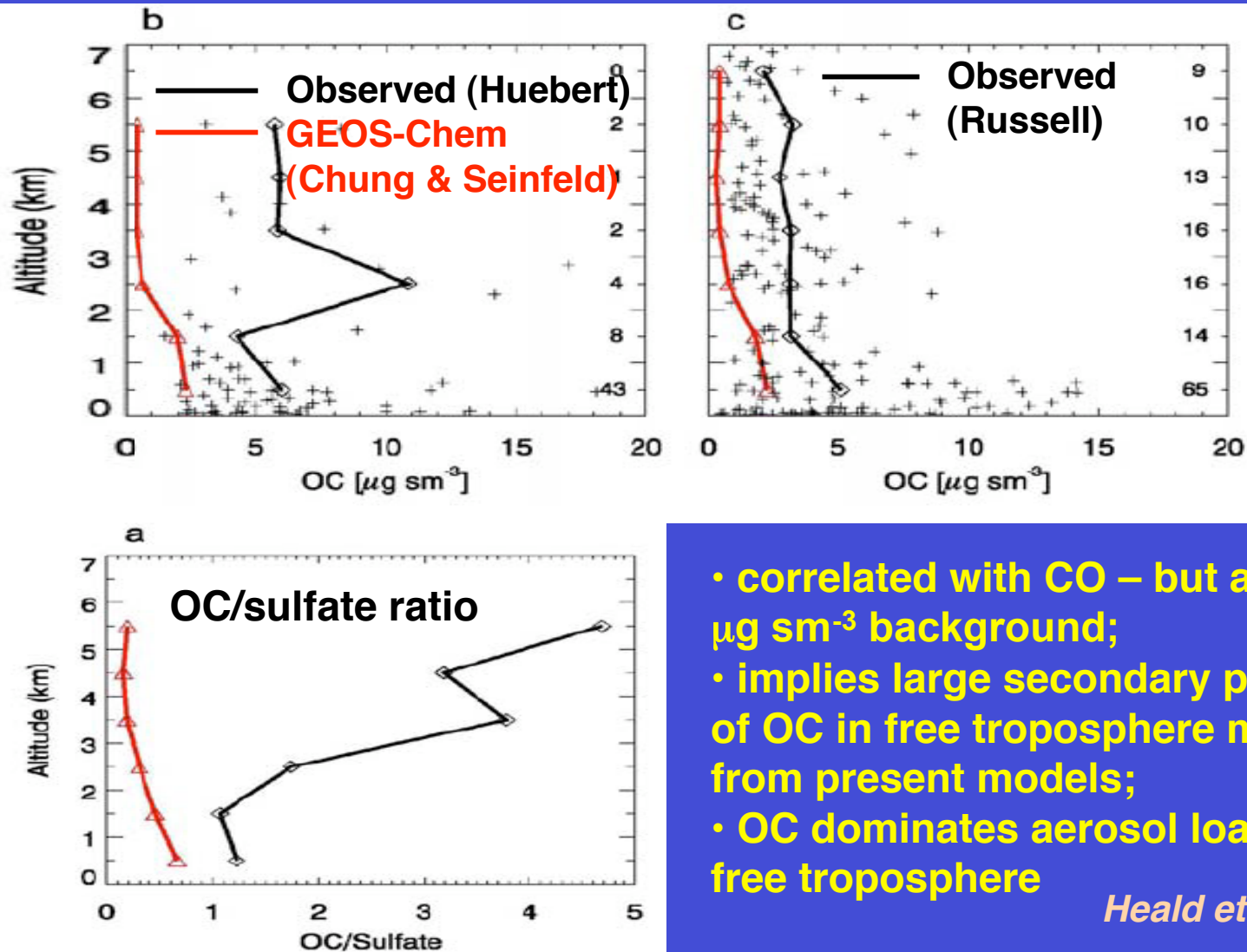


Sulfate is most important exported anthropogenic aerosol in model

Park et al. [2005]

...BUT ELEVATED OC AEROSOL IS OBSERVED IN FREE TROPOSPHERIC ASIAN OUTFLOW – CONTRIBUTION TO INTERCONTINENTAL POLLUTION?

ACE-Asia aircraft observations over Japan (spring 2001)



- correlated with CO – but also a 1-3 $\mu\text{g sm}^{-3}$ background;
- implies large secondary production of OC in free troposphere missing from present models;
- OC dominates aerosol loading in free troposphere

Heald et al. [2005]